

## AUSTRALIAN TERMITIDÆ.

## PART III.

BY WALTER W. FROGGATT, F.L.S.

(Plates XXXIV.-XXXV.)

Genus TERMES, Linné.

Head large, rounded, elliptical or quadrangular; eyes moderately large, projecting, and finely faceted; ocelli present, oblique or oval. Clypeus moderately large; labrum broad and rounded; antennæ 13-20-jointed, longer than the head. Prothorax heart-shaped, flattened, smaller than the head; tibiæ spined; plantula wanting. Wings large, rounded at the tips, costal and subcostal nervures running parallel to each other but not connected by cross nervures from base to apex, median and submedian nervures distinct, oblique, nervures variable. Scapular shield small, cross suture transverse. Cerci cone-shaped.

*Soldiers* with large heads, jaws projecting well in front, toothed or sabre-shaped, but always regular and matching each other.

Many build large nests, but others live under logs, stones, &c.

TERMES LACTEUS, Froggatt.

(Plate XXXIV., figs. 2, 2a.)

*Termes lactis*, Froggatt, Agric. Gazette, N.S.W., May, 1897, with Plate, p. 297.

Upper surface dark castaneous; antennæ and mouth parts light brown; under surface dark brown; wings fuscous; nervures brown; the whole insect covered with short scattered hairs extending over the wings. Length to tip of the wings 8, body  $3\frac{1}{2}$  lines.

Head almost spherical, slightly longer than broad, convex on the summit, truncate in the front. Eyes circular, moderately large, projecting on the sides; ocelli well in front of the eyes, narrow and elongate. Antennæ long and slender, 19-jointed, springing from a cleft in front of the eyes, 1st joint very large; 2nd about half the length; 3rd small, annular; 4th to tip moniliform, gradually increasing in size, and becoming more stalked and turbinate at the extremity. Clypeus small, narrow, with median suture; labrum large, rounded in front; palpi long and hairy; jaws stout, with three sharp teeth at the apex, an angular one below, and a large one at the base. Prothorax not as wide as the head, broader than long, flattened upon the summit, arcuate in front, slightly curved upon the sides, running round to the hindmargin, and terminating in a slightly arcuate tip. Legs long, thighs of a uniform thickness; tibiæ slender, with two fine spines at the apex; tarsi long, with large claw. Wings broad, rather pointed at the apex, thrice as long as broad; scapular shield small, cross suture transverse, with four parallel nervures branching out of it; costal and subcostal nervures stout, running close together to the tip; median nervure running parallel through the upper half of the wing, branching out about the middle of the wing and each branch again bifurcated before reaching the outer margin of the wings; submedian nervure stout at the base, with three short stout oblique nervures, and from seven to nine more slender ones, three or four of which are forked. In the hindwings the median nervure branches out of the subcostal beyond the scapular shield, and the basal oblique nervures are shorter and sometimes more forked, but the oblique nervures of both the median and submedian are alike irregular in number and disposition in both pairs of wings in a great number of specimens examined. Abdomen short and broad, rounded at the tip, cerci short and stout, projecting on the sides

*Soldier*.—Head bright yellow; antennæ and palpi pale yellow; jaws ferruginous, with the tips black; lightly covered with long hairs; thorax and abdomen dull white, the latter thickly covered with short hairs. Length  $2\frac{1}{2}$  lines. Head broadly rounded at

the base, with several pale lines or sutures sloping down to the base of the jaws; with a rounded short snout-like projection above the base of the clypeus, forming a rounded opening connected with a chamber in the head, from which the soldier when touched ejects a globule of milk-like fluid; antennæ long, slender, 16-jointed, similar in form to winged insect's, except the basal joint, which springing from a slight depression on the side of the head is somewhat longer; clypeus small; labrum triangular, broadest at the base, slightly round and sloping on the sides to a point, about a third of the length of the jaws; jaws sabre-shaped, without teeth, except a round knob at the base; slender, curved and crossing over each other at the tips when closed; palpi long. Prothorax not as broad as the head, rounded in front on either side, arcuate in centre, with slight median suture, and curving round on the outer margins to the apex. Abdomen narrow at the base, swelling out in the middle, rounded at apex; cerci large. Some specimens are striped down the centre of the back with two parallel mottled bands; these are very distinctly defined on all northern specimens.

*Worker*.—Head pale yellow, with a white trilobed mark in the centre and a dark spot on either side of the clypeus, the rest white. Length  $2\frac{1}{2}$  lines. Head spherical; clypeus quadrate, longer than broad; labrum not as broad as the clypeus, spade-shaped, rounded at the tip; antennæ jointed, thicker than those of the soldier; jaws short and stout, a curved fang at the tip, two sharp curved teeth below, and two angular ones at the base. Prothorax deeply concave in front, rounded on the sides and behind. Abdomen large, elongate-oval; cerci small and slender.

A description of the termitarium of this species has been given in the introductory part of this monograph, and also in a popular paper in the *Agricultural Gazette*.

*T. lacteus* is our commonest destructive species, and in all cases known to me in which houses have been damaged by white ants about Sydney, I have found them infested with this termite.

The soldiers are very plentiful in all the nests, and are remarkable for their ferocity, never retreating when a colony is disturbed

until all the workers have found shelter. They are at once recognizable by the globule of milk-like secretion above the jaws, which they eject at the first alarm. The winged forms are found in the nests in October; a queen is always present, and complementary queens are sometimes met with.

*Hab.*—Sydney, Shoalhaven, Blue Mountains, N.S.W., and Southport, Queensland (W. W. Froggatt); Uralla, N.S.W. (Mr. G. McD. Adamson); Gunbower, Vic. (Mr. G. J. Perrin); Kalgoorlie, W.A. (Mr. G. W. Froggatt).

This species has a very wide range in this colony and Queensland; it both forms nests, and is commonly found under logs, tree stumps, and stones. My Victorian and West Australian specimens were obtained under logs.

TERMES FEROX, n.sp.

(Plate XXXIV., figs. 1, 1a, 1b.)

Upper surface castaneous; underside of the abdomen ochreous; legs and antennæ lighter coloured; wings dark fuscous, nervures brown; very hairy and rather slender in form. Length to tip of the wings  $5\frac{1}{2}$ , body  $2\frac{1}{4}$  lines.

Head small, spherical, as long as broad, rounded behind, and slightly flattened on the forehead. Eyes small, round, projecting; ocelli small, elongate-oval in front of the eyes. Antennæ 16-jointed, springing from a cleft in front of the eyes; 1st large, stout cylindrical; 2nd shorter; 3rd smallest; 4th-9th hemispherical, increasing in size to the tip; 10th-12th turbinate; the terminal ones more stalked. Clypeus large, convex, arcuate behind, truncate in front with distinct median suture, rounded on the sides. Labrum large, broad and rounded in front; jaws short and broad, with four sharp angular teeth at the apex and a tuberculate one at the base. Prothorax not as wide as the head, longer than broad, heart-shaped, arcuate in the centre of basal margin, and sloping round the sides to the apex, flattened in the centre and depressed on the sides; legs short; thighs rather slender; tibiæ short, broadest at the tip with two stout ochreous spines; tarsi very hairy. Wings slender, rounded at the tips, four times as long as broad; scapular shield small, angular, with



cross suture transverse, indistinctly showing four parallel nervures; costal and subcostal nervures thick, running close together to the tip of the wing; median nervure very fine, passing through the upper half of the wing; submedian nervure in the centre of the wing, with four stout oblique nervures at the base and four more slender ones slanting towards the tip, second and last forked. Abdomen long, slender, rounded at the tip; cerci short and stout.

*Soldier*.—Head pale ochreous-yellow; antennæ pale yellow; jaws dark reddish-brown, black at the tips; the rest dull white. Length  $2\frac{1}{2}$  lines. Head large, twice as long as broad, convex above, rounded behind, straight on the sides of the antennal cleft; forehead arcuate on the summit with a rounded knob on either side, and a smaller one in the middle forming a triangle sloping sharply down to the base of the clypeus, corrugated on either side. Antennæ rather long, springing from a rounded cleft, 15-jointed; 1st large, cylindrical; 2nd half the length; 3rd very small; 4th twice as long as the last, cylindrical, rounded at the base; 5th-6th shorter and broader; 7th-14th turbinate; last elongate-oval. Clypeus large, truncate in front, rounded on the sides; labrum broad, swelling out on the sides, and then contracting to a rounded tip, reaching half way up the jaws; palpi slender, nearly as long as the jaws; jaws long, slender, sabre-shaped, and crossing over each other at the tips, untoothed, but roughened along the inner edge with a small rounded knob at the base. Prothorax much narrower than the head, arcuate in front, rounded on the sides, and slightly arcuate behind; legs short, with the thighs thick, and armed with two spines at apex. Abdomen elongate-oval.

*Worker*.—Head and upper surface of thorax pale yellow, rest white. Length 2 lines. Head large, orbiculate; antennæ 15-jointed, thicker and compressed on the basal half; clypeus long, narrow, rounded in front, with median suture, and a reddish spot on either side. Prothorax small, slightly concave in front, rounded on the sides; abdomen large, elongate-oval; cerci large and prominent.

This species is common about Sydney, living in small communities under stones, or old earthen walls, and sometimes form-

ing their galleries in the sides of the termitaria of *T. lacteus*. Their galleries are very irregular but strongly built and of a pale chocolate-brown colour, but appear to have no regular structure or distinct nest. The soldiers are generally numerous; and when their retreat is cut off they turn round, snapping their slender jaws together with a distinct click; both they and the workers—which are very light-coloured—seem to dislike the light, rushing off under ground as soon as the nest is opened. Winged specimens were found on the 3rd of February in a nest under some stones about 18 miles from Sydney.

*Hab.*—Thornleigh, near Sydney (W. W. Froggatt).

TERMES MERIDIONALIS, n.sp.

(Plate XXXIV., fig. 3.)

Winged form unknown.

*Soldier.*—Head bright yellow, jaws dark ferruginous at the tips; antennæ light coloured at the base of each segment; thorax pale yellow, rest of insect white. Length  $2\frac{1}{4}$  lines. Head spherical, a little longer than broad, rounded behind, sloping on the sides to the base of the jaws, convex on the summit; forehead rounded, fringed with a few long hairs, with a reddish spot on either side; antennæ 15-jointed; 1st very large springing from the side of the head; 2nd half the length and breadth; 3rd very short; 4th-11th moniliform; 12th-14th stalked, larger, and truncated; 15th elongate-oval; clypeus hidden, indistinct labrum broad, rounded at the tip and reaching to the middle of the jaws; jaws falcate, curving over each other at the tips, the inner edges smooth from the tip to about a third from the base where they are deeply cut into, narrow to the base where they again broaden out; palpi slender, long. Prothorax not as wide as the head, slightly concave in front, rounded on sides and apex; legs rather long and slender; tibiæ short, two basal spines long; tarsi long, terminal joint large, claws slender; abdomen elongate-oval, pointed at the tip, thickly clothed with fine hairs; cerci small, slender.

*Worker.*—General colour white, semi-transparent; head pale yellow. Length 3 lines. Head broad, convex, rounded behind,

longer than broad; median suture from the base merging into an angular white patch in the centre of the forehead; clypeus divided in the centre forming two rounded lobes, with a reddish spot on the outer edge; labrum large, rounded in front; jaws small, with two stout pointed teeth at the tip, tapering from the lower one to an angular tooth in the centre of the jaws, broad at the base; palpi slender. Prothorax small, truncate in front, sloping on the sides to hind margin; abdomen broadly oval; cerci small, slender.

*Hab.*—Palmerston, Port Darwin, N.T. (from the nest; Mr. N. Holtze; and Dr. Stirling, Adelaide Museum); North Queensland (Mr. C. W. DeVis, Queensland Museum); Mackay, Queensland (in dead logs; Mr. G. Turner); Moree, N.S.W. (in dead logs; Mr. F. Miller).

This is the species which constructs the remarkable "meridional" or "magnetic nests" found from near the Bloomfield River, North Queensland, to Palmerston, Port Darwin. I have never had an opportunity of examining these peculiar structures myself, but Mr. Dudley Le Soeuf informs me that they are found a few miles off the Bloomfield River. He says\*—"Some distance away from here, in the open country, the curious mounds of the Termites, called the Meridian White Ants, are found, but I was unable to visit them. They are said to build long narrow structures, always running from east to west, and never to vary from that direction."

A short account of the form of these nests is given in the Cambridge Natural History, Vol. v. p. 18, with a sketch from a drawing by Mr. Walker.

Mr. Holtze, who kindly sent me soldiers and workers taken direct from the nests, though he was unable to find winged insects or a queen, also sent me photographs of the nests with the following notes:—"These nests average from 10 to 12 feet in length in the form of a wall, convex on one side and concave on the other, the sides respectively facing the rising and setting

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\* "A Trip to North Queensland"; Victorian Naturalist, Vol. xi. 1894, p. 25.

sun." He did not give me the exact width of the nests; but, judging from the photographs, they are about eight feet in height, with the top straight, crowned with irregular little turrets. These nests are about 10 miles inland from Palmerston.

In a recent paper Mr. Jack,\* after giving an account of their structure, says:—"The reason of their being built at this angle is to secure the maximum of desiccation. They do not repair these nests in the long dry season; but when the wet season sets in repair all damages. Its safety lies in being dried as quickly as possible. In tropical latitudes it is obvious that this drying can best be secured by placing the longer axis of the structure north and south, so that the rays of the sun may beat upon it during the greater part of the day."

Professor Spencer states† that near Brinkley Bluff the Horn Expedition party came across a patch of the nests of these termites from 4 to 5 feet in height, of a bright red colour, about a hundred nests occupying half an acre of ground. Unfortunately no specimens were collected from them.

#### TERMES PARADOXUS, n.sp.

(Plate xxxv., fig. 2.)

General colour light brown; wings pale fuscous, darkest near the base; the whole insect thickly covered with long hairs. Length to tip of wing 5; to tip of body  $2\frac{1}{2}$  lines.

Head oval, longer than broad, slightly flattened on the summit, with a pustular mark in the centre, forehead concave in front; eyes large, coarsely faceted, projecting on the sides; ocelli wanting; antennæ long, robust, springing from a cleft in front of the eyes; 18-jointed, 1st stout, cylindrical; 2nd smaller; 3rd smallest; 4th-17th large, stalked, turbinate; 18th oval; clypeus large, lobed, rounded behind; labrum large, rounded; palpi long; jaws small, angular, bearing 4 small teeth. Prothorax heart-shaped, not as broad as the head, arcuate in the centre of the front margin,

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\* Notes on the Meridional Ant Hill of the Cape York Peninsula. Proc. Royal Society, Queensland, Vol. xii. p. 99, 1897.

† Report Horn Scientific Expedition, Part I. 1896, p. 129.

rounded on the sides to the hind margin; flattened on the summit, with the sides depressed, a median suture; legs robust; thighs thick; tibiæ slender, cylindrical, armed with two slender reddish spines; terminal tarsal joint and the claws long, slender. Wings long and narrow, rounded at the tips, four times as long as broad; scapular shield small, slender at the base, cross suture rather convex, with four parallel nervures branching out of it; costal and subcostal nervures stout, running parallel to each other to the tip; median nervure very fine, rather irregular, running through the upper half of the wing, unbranched; submedian nervure running through the middle of the wing, with five stout oblique nervures, and from 6 to 8 slender ones; in some specimens about half of them bifurcated. Abdomen slender, segments rather long, rounded at the extremity; cerci short.

*Soldier*.—Head light yellow, jaws dark ferruginous, black at the tips, rest dull white. Length  $2\frac{1}{2}$  lines. Head large, longer than broad, rounded behind, concave on summit, sloping on the sides and contracted at the base of the jaws; behind the clypeus is a curious lobed marking of a lighter colour than the rest of the head; forehead projecting and hiding the clypeus; antennæ springing from a cleft near the base of the jaws; 17-jointed; labrum large, parallel on the sides but rounded at the tip; jaws slender, untoothed, springing from the centre of the head, sabre-shaped, straight to near the tips which curve inwards; when at rest crossing over each other about the centre. Thorax like that of winged insect; legs stout; tibiæ covered with short reddish spines, as well as the two stout apical ones. Abdomen slender, cylindrical, rounded at tip; cerci slender.

*Worker*.—Head light brown; rest dull white. Length 2 lines. Head almost spherical, convex on summit; forehead arcuate in front; clypeus large; labrum rounded in front; jaws small, angular, with five pointed teeth, 4th largest, and 5th smallest. Abdomen large, elongate-oval.

*Hab*.—Mackay, Queensland (Mr. G. Turner).

The specimens were taken from a small colony under a log, and are the only examples of this curious species I have seen.

## TERMES RUBRICEPS, n.sp.

(Plate XXXIV., figs. 9, 9a.)

Winged form unknown.

*Soldier*.—Head and jaws bright reddish-brown; antennæ reddish, pale at base, dorsal surface of the thorax brown; the rest light brown; abdomen covered with short hairs, legs spiny. Length 3 lines. Head very large, broad, rounded behind, convex on the summit, and flattened on the forehead; sides contracting from the base of the antennæ to the jaws; antennæ long and slender, 17-jointed, springing from the side of the head near the base of the jaws; 1st joint large, cylindrical; 2nd smaller; 4th smallest, 5th-16th cylindrical, slightly stalked, and rounded at the tips; clypeus small, narrow, lobed; labrum broad, short, rounded at the tip; jaws long, slender, sickle-shaped, slightly irregular on the inner margin, a deep incision cutting into the fangs, followed by a large angular tooth springing out on either side in line with the tip of the labrum, the jaws curving over each other above the tip of the labrum; palpi long and slender, as long as the jaws. Thorax very small, rounded in front and on upper half of the sides, but much broader on the hind half; legs very long and slender; tibiæ cylindrical, with two large apical spines; tarsi hairy. Abdomen slender, elongate-oval; cerci long and slender.

*Worker*.—Colouration similar to that of the soldier. Length 3 lines. Head rounded behind, longer than broad, convex on the summit, flattened and sloping to the forehead; the latter arcuate in front, with the tips forming a projecting point on either side above the deep antennal cleft; antennæ 18-jointed, shaped as in the soldier; clypeus large, rounded behind, convex on the summit and slightly truncate in front; labrum short, broad, rounded in front; palpi long; jaws small, short, with two strong angular teeth at the apex, a smaller broad one below, and an irregular one at the base. Abdomen elongate-oval; cerci slender.

*Hab.*—McKinley Ranges, Central Australia (Professor W. B. Spencer).

The soldier of this curious termite somewhat resembles *Termes nigriceps* in the form of the jaws, but is a very distinct species in all other respects. It appears to be one of the common species in that part of Central Australia visited by the Horn Expedition, as Professor Spencer obtained several small colonies. A note with the largest lot states that they were taken from a nest at the roots of a tussock of spinifex grass.

TERMES SERRATUS, n.sp.

(Plate XXXIV., fig. 5.)

Winged form unknown.

*Soldier*.—Head bright ferruginous, darkest at the apex; jaws dark reddish-brown, black at the tips; antennæ and palpi light brown; prothorax pale yellow; rest dull white. Length 2 lines. Head slender, much longer than broad, rounded behind, summit convex; a slight median suture, merging into a transverse one; forehead rounded, with a stout tubercle projecting at the sides in front of the antennæ, truncated above the jaws; antennæ 13-jointed, slender; 1st large, cylindrical, 2nd smaller, 3rd smallest, 4th-13th gradually increasing in size and more turbinate towards the tip; clypeus large, lobed behind, almost round; labrum long, slender, broadest at the base, straight on the sides to the rounded spade-shaped apex; jaws very slender, projecting from the centre of the head, narrow at the base, nearly as long as the head, curving in at the tips and crossing; finely serrated along the inner margins; palpi long and slender, but not as long as the jaws. Thorax small; prothorax not as wide as the head, truncate in front, rounded on the sides and hind margin; legs long, thighs rather thick in proportion to their length; tibiæ stout, cylindrical, with two apical spines; tarsi slender. Abdomen elongate-oval; cerci small, conical.

*Worker*.—Head pale yellow, the rest white. Length 2 lines. Head round, slightly longer than broad, with sutures as in that of the soldier; antennæ springing from cleft on the sides of the head, 13-jointed, 4th-12th elongate, 13th elongate-oval; clypeus truncate behind, narrow, rounded in front; labrum broadest at



base, contracted at the extremity to a truncated tip. Prothorax very small. Abdomen hairy, elongate-oval; cerci small.

*Hab.*—Torrens Creek, N.Q. (Mr. J. H. Chisholm).

A small tube containing seven specimens, sent by this gentleman, but without information as to habits.

TERMES KRISIFORMIS, n.sp.

(Plate XXXIV., figs. 6, 6*a*.)

Winged form unknown.

*Soldier.*—Head pale yellow; jaws ferruginous; prothorax pale yellow, rest dull white. Length 3 lines. Head very long, slender, cylindrical, slightly rounded behind, sides straight to the base of the antennæ, where they turn sharply up to the base of the jaws; suture crossing head and meeting a transverse one, and forming an angular patch in the centre; forehead projecting in front, rugose and hiding the clypeus; antennæ 14-jointed, springing from clefts in the front of the head in a line with the base of the jaws; 1st very large, rounded at the tip; 2nd-3rd of about equal length; 4th smallest, oval; 5th-13th oval, more pyriform and increasing in size to the tips; 14th longest, oval; labrum long, broad at the base, slightly contracted to the apex, which is truncate, with a sharp point on either side; jaws narrow at the base, very slender, and rising upward, instead of produced straight in front of the head, and then bending down again, of an irregular thickness, curving round at the extremities into a hollow auger-like tip coming to a point. Prothorax very narrow, truncate in front, with rather angular sides running round to apex; legs rather long; thighs thick, tibiæ short, with two stout apical spines, claws large. Abdomen elongate-oval, with slender cerci.

*Worker.*—Head brownish-yellow, rest dull white. Length  $2\frac{1}{2}$  lines. Head orbicular, rounded to the base of the antennæ; the latter 14-jointed; clypeus large, rounded on both sides and lobed in the centre; labrum narrow, rounded at the tip; jaws large and stout, with two broad pointed teeth near the tip. Abdomen broad, tapering towards the tip; cerci slender and hairy.

*Hab.*—Sutherland, near Sydney (W. W. Froggatt).



As far as I know this species is very local in its distribution. I have found several small lots in the above locality, forming irregular galleries under dead logs, but I have never found them anywhere else near Sydney.

TERMES ERRABUNDUS, n.sp.

(Plate XXXIV., fig. 4.)

Winged form unknown.

*Soldier*.—Head bright ferruginous, clypeus pale yellow, jaws black; antennæ and mouth parts pale brownish-yellow; legs and dorsal surface of the prothorax pale ochreous; rest dull white, lightly covered with short hairs. Length 6 lines. Head slightly longer than broad, convex on the summit, rounded behind, in the centre, flattened behind the forehead, a scroll-like mark receives a faint parallel suture from the base of the head; front of the forehead rugose, with a dark coloured patch on either side; antennæ 25-jointed, slender, tapering to the tips, and springing from a slight tubercule on the side of the head; 1st very large, swelling out at the apex; 2nd smaller, rounded on the sides; 3rd, 4th smallest, annular; 5th-19th moniliform; 20th to the tip pyriform, becoming smaller and more stalked to the terminal one, which is much smaller than the others; clypeus nearly quadrate, lobed, broader than long; labrum large, a little broader than long, narrow at the base, and fringed with hairs; jaws short, stout, rounded, curving over each other at the tips, with a large angular tooth about one-third from the tip, and a smaller one at the base; palpi slender, longer than the jaws. Prothorax not as broad as the head; divided down the centre by a depression, which forms the front into a rounded collar, and the apical half into a semicircular raised ridge, coming to a rounded point on either side; legs moderately long, stout, tibiæ armed with four spines at tip; tarsi long; claws large; plantula noticeable; inner edge of the thighs of forelegs covered with fine ferruginous spines. Abdomen short and broad; anal appendices large, slightly in front of the cerci; the tips of the four being nearly in a line.

*Worker*.—Head pale yellow, with spots on the forehead, base of jaws and tarsal claws ferruginous. Length 7 lines. Head

large, more rounded than that of the soldier, the scroll mark above the forehead very distinct, forming two white oval marks; the brown spots on either side of the clypeus very distinct; clypeus sloping on the sides; antennæ as in soldier except that the 3rd-6th joints are smaller and annular, jaws very large and strong, a sharp fang at the tip, two smaller ones below, and a broad one at the base. Inner surface of the forelegs much more thickly covered with fine spines. Abdomen long and cylindrical; cerci and anal appendices stout and hairy.

*Hab.*—Torrens Creek, N.Q. (Mr. J. R. Chisholm); Lyndhurst Station, N.Q. (Mrs. Black); North Queensland (Mr. C. W. DeVis, Queensland Museum); Hall's Creek, Kimberley, W.A. (Mr. W. O. Mansbridge).

This is the common large species of Northern Australia, where it gets into wood-work, and often does a great deal of damage. Mrs. Black sent me a tube full of workers and soldiers taken at a station about a hundred miles inland from Lolworth Station, Townsville.

Mr. Mansbridge sent me the following note:—"These termites were taken from a piece of timber lying on the ground; they are very destructive, and will in a very short space of time destroy deal boards (to which they are very partial) if left in a dark corner or shady spot."

TERMES PERNIGER, n.sp.

(Plate xxxv., fig. 3.)

Winged form unknown.

*Soldier.*—Head black, shining, jaws ferruginous tipped with black, antennæ and palpi brown, with the base of each segment light coloured; prothorax dark brown; legs and under surface brown, upper surface of thorax and abdomen light ferruginous. Length  $3\frac{1}{2}$  lines. Head very large, as broad as long, broad at the base, rounded on the sides to the base of the jaws; convex on summit, flattened in front, and slightly arcuate on the forehead; antennæ long and slender, 17-jointed; 1st long, cylindrical, 2nd-4th cylindrical, 4th smallest, 5th-16th broader, rounded at the tips; 17th elongate-oval; clypeus hidden at the base, but showing two

rounded lobes in front; labrum large, broad at the base, rounded at the tip; jaws as long as the head, square at the base, curving out into two large sickle-like blades crossing each other in the centre when at rest, armed with a slender pointed tooth on either side, standing sharply out in a line with the tip of the labrum; palpi very long and slender, nearly as long as the jaws. Prothorax not as broad as the head, flattened on the dorsal surface, with an irregular median suture and a transverse impression in the centre; the front margin rounded, slightly arcuate in the centre; rounded on the sides to about the middle, where they swell out into a broad angular point round to the apical; legs very long and slender, the tibiae covered with short spiny hairs as well as three stout spines at the tips, the 4th tarsal joint long and slender. Abdomen thickly covered with long hairs, constricted at the base, swelling out, and forming a broad rounded tip; cerci short and stout.

*Worker*.—Head ferruginous to dark brown, with pale suture crossing the centre of the head; prothorax ferruginous; rest light brown. Length  $3\frac{1}{2}$  lines. Head large, rounded behind, a little longer than broad, forehead deeply arcuate on the sides, depressed in the centre behind the clypeus; clypeus slightly lobed in the centre, sloping on the sides to a rounded tip; labrum broad, rounded at the tip; jaws broad and stout, with two sharp angular teeth at the tip, and two broad flattened teeth towards the base; antennae springing from a cleft, of the same form as in the soldier. Abdomen large, narrow at the base, swelling out near the centre, and sloping down to the extremity; cerci small.

*Hab.*—Kalgoorlie, W.A. (Mr. G. W. Froggatt).

The very dark colour, immense curved jaws, the long slender legs and antennae make the soldier of this species very distinctive.

These very curious termites were found under a dead log upon the ground by my father, who says, "I found a numerous colony of workers and soldiers under a log unlike any other species about here. The soldiers were very savage, when touched exuding a white milky substance and biting so viciously that if once they

caught hold with their enormous jaws you could pull their heads off before they would let go."

Later on in the season my father sent the following note (Nov. 20th) with a tube containing some more specimens of this species: "My attention was drawn to a little lizard in front of my door very busy picking up something, which turned out to be these white ants. I had not seen any white ants for some months in any of the nests, but there had been a slight shower of rain in the morning. The ground was perfectly clear of timber or stumps and dry and dusty for a considerable depth, but these little miners were boring up from beneath and coming to the surface to carry down bits of grass lying upon the surface. Little black ants were also carrying them off as they appeared; by the time I had filled the tube they had all disappeared under ground again. I took a watering can and sprinkled the same ground next morning, but could not induce any more to come up, so they must know the difference between natural rain and irrigation."

TERMES TURNERI, n.sp.

(Plate XXXIV., figs. 8, 8a.)

General colour dark castaneous, head darkest, antennæ brown, the basal portion of each segment lighter coloured; legs and chitinous bands of undersurface of the abdomen light brown; wings fuscous; nervures darker. Length to tip of wings 5, to tip of body  $2\frac{1}{2}$  lines. Head longer than broad, rounded behind, flattened on the summit, forehead arcuate; eyes large, circular, projecting well out from the side of the head; ocelli round, in a line with the front margin of the eyes; antennæ 13-jointed, short, slender, and very hairy, springing from a circular cleft in front of the eyes; 1st short, stout, cylindrical; 2nd very short; 3rd-5th short, rounded and thicker; 6th-12th larger, almost as broad as long, rounded at the base, truncate at apex; 13th rounded at the extremity; clypeus large, convex, lobed, truncate in front, rounded behind; labrum large, projecting, rounded at the tip; jaws with two sharp teeth at tip, lower part forming a broad flattened edge, arcuate in the centre. Prothorax not as wide as the head,

truncate and slightly arcuate in the centre, the sides and hind-margin forming a half-circle; meso- and meta-thorax large, flattened; legs rather long, thighs stout, tibiæ long, slender, the two apical spines large; tarsi long, claws large; wings four times as long as broad, rounded at the tips; scapular shield small, with the cross suture transverse, showing the base of four branching nervures, costal and subcostal nervures robust, running close together to the tip of the wing; median nervure branching out of subcostal beyond the cross suture, and running parallel through the upper half of the wing, turning downward towards the tips, sometimes unbranched, in other specimens divided into two, and again bifurcated at the tip; submedian with from 9 to 11 oblique nervures, the first five basal ones thickened, the bifurcation not constant. Wings thickly covered with fine hairs, forming a delicate fringe along the costal nervure. Abdomen long, cylindrical, of a uniform thickness to the rounded tip, thickly clothed with fine hairs; cerci very small.

*Queen* lighter coloured, with the chitinous plates of the abdomen light brown. Length of abdomen 1 inch, diameter  $3\frac{1}{4}$  lines.

*Soldier*.—Head pale ochreous, darkest towards the apex, the jaws ferruginous at the base, black at the tips, the rest dull white. Length  $2\frac{1}{2}$  lines. Head very large, longer than broad, rounded behind, rather straight on the sides, and rounded from the base of the antennæ to the jaws, the summit flattened, with the forehead raised forming an elevated patch divided by a median suture; clypeus narrow, slightly lobed in front; labrum broad at the base, rounded on the sides, covering the base of the jaws, and forming a spade-shaped tip; jaws long, slender, untoothed, springing from the centre of the head and crossing each other close to their base; antennæ 13-jointed, similar to those of winged form. Prothorax small, truncate in front, rounded behind; legs slender; abdomen large, elongate-oval; cerci small.

*Worker*.—Head brownish-yellow, with dark ferruginous spots on the sides of the forehead. Length 3 lines. Head slightly longer than broad, convex, with a median suture branching in the centre

of the forehead on either side of an angular patch, while the front margin of the forehead forms a raised crescent-shaped ridge, coming to a sharp point on either side in front of the base of the antennæ; clypeus large, convex, divided into two lobes; labrum large, rounded in front; jaws small, with two sharp teeth at the tip, and two large and hatchet-shaped below. Thorax small. Abdomen large, elongate-oval; cerci small and slender.

*Hab.*—Mackay, Q. (Mr. G. Turner).

This species is restricted in its range, as I have had it only from the vicinity of Mackay, where it is a common species. I am indebted to Mr. Turner for the following notes:—"The nests are plentiful and vary from one to two feet in height, of an irregular cone-shape, and eighteen inches in diameter at the base. The queen's cell was found about the centre of the nest but rather nearer the base, and was regular in form, measuring  $\frac{3}{8}$  of an inch in height and  $2\frac{1}{2}$  inches in diameter. Winged insects were noticed flying about the lights on the 29th of October, and several nests examined a few days later were found to be swarming with winged termites. The clay casing of the nests is in many instances occupied by colonies of *Formicidæ*, among which were *Bothnoponera sublaevis*, *Ectatomma convexum*, and a species of *Pheidole*."

The jaws of the soldiers are very distinctive, slender at the base; they stand out in front of the head, occupying only the central part of the front margin on either side of the labrum, and when at rest just touching at the tips, but when fighting crossing over each other right to the base.

#### TERMES AUSTRALIS, Walk.

(Plate xxxv., fig. 1.)

*Termes australis*, Walker, Brit. Mus. Cat. p. 523; Hagen, Mon. Term. p. 173, tab. III., f. 22.

General colour light ferruginous; head darker; prothorax lighter; wings hyaline, slightly iridescent, nervures brown; robust and rather hairy. Length to tip of wings 6, to tip of body 3 lines.

Head longer than broad, convex, flattened on the forehead; eyes large, round; slightly projecting; ocelli large, in front of the eyes; antennæ 20-jointed, springing from a cleft in front of the eyes; 1st joint stout, 2nd smaller, 3rd smallest, 4th-20th moniliform, elongated at tip; clypeus convex behind, narrow, rounded and lobed; labrum large, long, rounded at the tip; jaws short, broad, with 4 sharp teeth at apex, the second smallest, and a large double tuberculate tooth at the base. Prothorax as broad as the head, a little broader than long, truncate in front, slightly arcuate in the centre, sides rounded, convex behind. Wings three times as long as broad, ovate at the extremities; scapular shield stout, with the cross suture not so transverse as usual, showing the base of 4 branching nervures; costal and subcostal nervures running parallel (not so close as in most species) to the tip; median nervure slender, crossing through the upper portion of the wing, with a small bifurcation at the extremity; submedian nervure dividing the wing through the centre, with two short stout oblique nervures at the base, and from 8 to 10 finer oblique nervures occupying the lower half of the wing; the whole of the wing covered with very fine scales giving it a whitish appearance. Abdomen of a uniform width to the tip; cerci small.

*Hab.*—Adelaide, S.A. (Mr. J. G. O. Tepper).

This species was described from specimens obtained at Adelaide. Hagen redescribed it in his Monograph, stating he had seen pinned specimens of both sexes; he also adds that the workers and soldiers described by Walker with the winged ones have no relation to this species, but are those of an undescribed species of *Calotermes*.

My description is taken from a number of carded specimens, obtained by Mr. Tepper, flying round a lamp at night; but though it is the common winged termite about Adelaide, I have been unable to obtain soldiers and workers from a nest that I was satisfied belonged to the winged ones, but hope to do so before the season is over. Mr. Tepper believes that this species does not form any nests, but lives underground, and is the one locally destructive to houses and woodwork.

## TERMES ACINACIFORMIS, n.sp.

(Plate XXXIV., figs. 7, 7a.)

General colour light brown tinged with ochreous; head light castaneous; wings hyaline, with nervures light brown, thickly covered with short brown hairs. Length to tip of wings  $6\frac{1}{2}$ , to tip of body 4 lines.

Head rounded on the sides, broad behind, truncate in front and sloping down on the forehead to the clypeus; eyes large, very prominent, and finely faceted; ocelli reniform, well in front of the eyes; antennæ 17-jointed; 1st shorter than usual, broadest at apex; 2nd smaller, cylindrical; 3rd smallest, rounded and compressed; 4th-17th turbinate, broader at the apex and increasing in size to the tip; 18th elongate-oval; clypeus narrow, sloping on sides from the base, slightly arcuate in front; labrum small, narrow, rounded in front; jaws long, with three pointed teeth near the tip, a broad one below and the base thickened. Prothorax slightly arcuate in front, broadly rounded on the sides, slightly flattened on the summit and deeply arcuate behind; legs robust, thighs short and thick, tibiæ slender, thickly fringed with spiny hairs and stout reddish apical spines; tarsi long, slender, claws large. Wings rather broad and short, more than twice as long as broad; scapular shield very small, cross suture transverse, showing 4 parallel branching nervures; costal and subcostal nervures very stout, running parallel close to each other to the tip; median nervure running through the upper half of the wing, bifurcate at the tip; submedian stout at base, with about 10 oblique nervures, the first four very stout, bifurcated soon after branching from submedian and again branching at their tips, the rest more slender, with irregular bifurcations; the whole wing finely granulated. Abdomen rather short, broad at base, rounded at the tip; cerci slender.

*Soldier*.—Head and prothorax bright yellow; jaws ferruginous, tipped with black, rest white. Length 3 lines. Head longer than broad, rounded behind, tapering from behind the base of the antennæ to the jaws; antennæ springing from a cleft on the side of the head, 17-jointed as in the perfect insect; clypeus hidden;



labrum short, broad at the base, coming to a sharp point at the tip in front; jaws untoothed, slender, scythe-shaped, curving over each other at the tips; palpi long, slender, hairy; prothorax not as broad as the head; legs slightly longer than in winged form. Abdomen short, very hairy, rounded at the tip; cerci large.

*Worker*.—Head pale yellow, the rest white. Length 3 lines. Head rounded, about as broad as long; flattened on the summit; antennæ 17-jointed, somewhat thicker than usual; clypeus small, narrow, truncate in front, divided in the centre by a median suture; labrum broad, rounded in front; jaws broad, stout, with 3 sharp teeth towards the tip and a broad square one at the base. Prothorax heart-shaped. Abdomen large, elongate-oval, with a curious dull brown angular pattern down the centre of the back; cerci large, hairy.

*Hab.*—Hall's Creek, Kimberley, W.A. (Mr. W. O. Mansbridge).

Mr. Mansbridge says:—"These termites were taken from the heart of a gum-tree some 20 feet from the ground, and had completely eaten the centre out of the tree, only a mere shell remaining; most of the trees in this district are eaten out in the same manner by this species."

The soldiers are very like those of *T. lacteus*, our common Sydney species, but the winged forms are very distinct from any other species I have examined. The thick costal and subcostal nervures and the curiously granulated wings are very characteristic.

#### TERMITINÆ.

##### Genus EUTERMES, Heer.

Head rounded, generally broadest behind; suture indistinct; eyes moderately large; ocelli reniform or sometimes narrow and oblique; clypeus large; antennæ 12- to 16-jointed, generally hairy, with the terminal joints thicker than the basal ones. Prothorax truncated in front, the sides and hindmargin forming a half-circle, sometimes depressed at the base; thorax generally narrow; plantula wanting, a small spine at the tip of tibiæ. Wings large, broad, usually fuscous or dark-coloured; scapular shield slender and the base of the parallel nervures not so distinct as in *Termes*; oblique nervures both variable in distribution and numbers.

*Soldiers* with nasuti or pike-shaped heads furnished with a chamber connected with the snout through which they can eject a drop of honey-like fluid; very small, and much more numerous in the nests in proportion to the workers than in other genera.

The members of this genus construct regular nests over tree stumps, grass, &c., and also rounded nests on the trunks or branches of trees connected by covered galleries leading up from the roots of the tree. Only a few species form irregular galleries under stones and logs.

The members of this genus have a world-wide range, but are most numerous in the tropics. Over thirty species have been described, more than two-thirds of which come from South and Central America.

Two fossil species have been described from Europe by Heer and Hagen.

EUTERMES MAGNUS, n.sp.

(Plate xxxv., fig. 6.)

Dark reddish-brown, the legs and basal portion of abdominal segments lighter-coloured, the undersurface ochreous, the head darkest, thickly covered with coarse hairs; the wings light ferruginous-brown with the costal and subcostal nervures darker. Length to the tip of the wings 14 lines, to the tip of the body 8 lines; breadth across the shoulders  $1\frac{1}{2}$  lines.

Head rounded, swelling out and broadest behind the eyes, flattened on the summit, deeply arcuate behind the clypeus and forming an angular point on either side; eyes very large, round, and projecting on the sides, rather coarsely faceted; ocelli large, reniform, in front of the eyes; antennæ composed of 16 joints, stout and very hirsute; 1st joint large, cylindrical, springing from cavity beyond the inner margin of the eyes; 2nd and 3rd smaller; 4th to 15th turbinate, but becoming more cylindrical and less stalked to the tip; 16th elongate-oval; clypeus large, broad, rounded, and with slight median suture; clypeus narrow at the base, swelling out on the sides and rounded in front; palpi stout and very hirsute; jaws large, with two curved pointed teeth at

the tip, two smaller angular ones near the centre and the edge towards the base finely serrate. Prothorax not so broad as the head, thickly covered with stout hairs, concave in front, rounded and narrow on the sides and rounded behind, rather flattened on the summit, a dark median suture through the centre of the meso- and metathorax. Legs robust, moderately long and very hairy, thighs slightly curved; tibiae long, thickly covered with stiff spiny hairs, with two long spines at the apex; tarsi slender, with a fine spine at the apex of the first 3 joints as well as a thick coating of hairs; the 4th joint and tarsal claws large. Wings large, slightly more than three times as long as broad, rounded at the tip; scapular plate small, short, depressed on costal edge at the cross suture, the costal and subcostal nervures robust, running close together to the tip of the wing, the base of the first and the lower edge of the latter finely lined with yellow, the median nervure running through the upper half of the wing, with several fine nervelets branching out from its upper edge towards the subcostal, and forked at the tip; submedian nervure running parallel to the median but turning down behind the bifurcation of the former, with four stout convex nervures and six slender ones, the last forming a broad fork. Abdomen large, elongate-oval, broadest in the middle, the abdominal plates long, rounded at the tips and thickly covered with short hairs; cerci short, stout and cylindrical.

*Queen*.—Abdomen one inch in length and  $3\frac{1}{2}$  lines in diameter, of a general white colour, the chitinous plates dark brown, covered with coarse hairs, and the intersegmental membranes covered with fine downy hairs. The antennae appear to be more slender and the spines upon the tibiae and tarsi more distinct.

*Soldier*.—Head dark castaneous, the rest ochreous-yellow with the centre of prothorax and the abdominal plates pale ferruginous. Length  $2\frac{1}{2}$  lines. Head hemispherical, lightly covered with a few hairs, tapering in front to the snout which is nearly as long as the rounded portion of the head; palpi long and slender, but not reaching to the tip of the snout; antennae composed of 14 joints, long and slender, the apex of each much lighter than the basal

portion; 1st segment large, cylindrical, thrice the length of the 2nd; 2nd short, cylindrical; 3rd longer; 4th to tip elongate, slender at the base, broader and rounded at the apex. Prothorax narrow, almost straight along the front margin, rounded on the sides and behind; legs long, the thighs contracted at the base, stout, cylindrical; tibiæ long, with stout spines at the apex; tarsi as in winged insect. Abdomen large, very broad in the middle, rounded at the extremities; cerci large, conical and hairy.

*Worker*.—Upper surface of the head brown, with two spots in front and a pale suture through the centre of the head; the rest pale ochreous, with the centre of the dorsal plates slightly darker. Length  $3\frac{1}{2}$  lines. Head broad, rounded, swelling out on the sides, but contracted at the base of the antennæ, the summit rounded, with a pale transverse suture above the clypeus meeting the cross suture through the forehead; antennæ 15-jointed, lighter-coloured but similar in form to those of the soldier; clypeus rounded behind and lobed, concave in front; labrum narrow at the base, sloping on the sides, broadest and rounded at the tip; jaws large, with two stout teeth near the tip, arcuate beneath, with a blunt tooth and an angular indentation below, swelling out again at the base of the jaw. Thorax very narrow. Abdomen large, elongate-oval, rounded at the tip; cerci rather small, conical.

I am indebted to Mrs. Black, of Lolworth Station, North Queensland, for this species and for an interesting account of their nests and habits. Mrs. Black says:—"This white ant builds a dome-shaped nest from 2-3 feet in height, and 3-4 feet in diameter, upon the dry basaltic ridges close to the homestead. I opened some nests in May, and found several queens. The black gins with me preferred to use their hands in excavating the centre of the nests, and soon became adepts in finding the queens.'

About the middle of November Mrs. Black found a lot of winged termites flying about the house, and thereupon went out and examined a nest close to the house whence she obtained plenty of winged termites, with the workers and soldiers, which she brought down when visiting Sydney, thus completing the series.

This species is remarkable for the great size of the winged form in comparison with the soldiers and workers. The soldiers and workers also have much darker heads than any New South Wales species known to me.

Mr. J. R. Chisholm, of Torrens Creek, N.Q., sent me a rough sketch of the nest and a general account of the habits of this species, which is common about his homestead at Coalbrook Plains Station.

EUTERMES TRIODLE, n.sp.

(Plate xxxv., fig. 8.)

Upper surface of the head, thorax, scapular, and the abdominal plates castaneous; the rest pale ochreous; wings fuscous, the nervures darker. Length to the tip of the wings  $5\frac{1}{2}$  lines; length to the tip of the abdomen  $2\frac{1}{2}$  lines.

Head perfectly round behind, as broad across the eyes as from the base of the head to the front of the clypeus, the forehead sloping down, the whole thickly covered with fine hairs; eyes large, round, slightly projecting; ocelli large, irregularly oval, in a line with the centre of the eyes; antennae composed of 15 short rounded hairy joints; 1st large, cylindrical; 2nd shorter; 3rd shortest; 4th to 14th broadly turbinate; last one elongate-oval; clypeus large, deeply divided in the centre and forming two prominent lobes sloping in on the sides and slightly truncated in front; labrum narrow, rounded in front; jaws moderately large, with a sharply curved tooth at the tip, deeply concave below, with an angular tooth below and a square edge towards the base. Prothorax broad, not as wide as the head, truncate in front, narrow at the extremities and broadly rounded behind, saddle-shaped. Legs moderately long; thighs thick; tibiae long, slender; last tarsal joint long and slender; claws large and curved inwards. Wings three times as long as broad, rounded at the extremity; scapular shield small; costal and subcostal nervures running close together and meeting just at the tip; the latter much stouter than the former, the median nervure running through the upper half of the wing unbranched, the submedian nervure running very close to the median, with 11 to 12 oblique nervures,

the first six thickened, and the last two forming a narrow fork at the tip. Abdomen long, slender, rounded at the tip, with small cerci.

*Soldier*.—Head dark castaneous-brown, darkest on the sides and the base of the snout, the tip reddish-brown; antennæ ochreous, with both extremities of each segment lighter-coloured; dorsal surface of the prothorax and abdominal segment marked with brownish-yellow; the rest yellow. Length  $1\frac{3}{4}$  lines. Head almost round to the base of the antennæ, with the apical portion produced into a rather short pointed snout, the head showing a slight suture through the centre; antennæ composed of 14 slender joints; 1st stout, truncate and cylindrical; 2nd smaller and shorter; 3rd more slender; 4th to 13th elongate, pyriform, becoming more rounded towards the tip, the terminal one oval, slightly stalked at the base; palpi extending beyond the tip of the snout. Prothorax along the front edge forming a raised ridge, coming to a rounded point at the sides and rounded behind, with a slight median suture running through the meso- and meta-thorax; legs long and slender; thighs nearly as long as the tibiæ; tarsi slender and hairy. Abdomen small, oval, rounded at the tip, covered with long hairs; cerci large and conical.

*Worker*.—Head pale yellowish-brown, with the centre of the upper surface dark brown, divided into two rounded patches by a pale yellow suture down the centre which meets a cross suture below the forehead, forming another transverse brown band and a dark spot on either side behind the labrum; the rest pale yellow; thoracic segments rather darker. Length of body 3 lines. Head very broad behind, rounded on the sides and summit, broader than long; clypeus very prominent, deeply divided in the centre into two convex lobes, rounded behind and on the sides, arcuate in front; labrum narrow at the base, sloping out to the rounded tip; jaws thick and stout; 1st tooth short and pointed, 2nd close beneath, much smaller, sloping out and forming a flattened edge to base; antennæ 14-jointed, slender, 1st segment large, 2nd about half the size, 3rd and 6th elongate, 7th-13th turbinate, the terminal one elongate-oval. Legs and thorax as in the soldier. Abdomen large, elongate-oval; cerci large, conical.

Mr. W. O. Mansbridge, Warden at Hall's Creek, Kimberley Goldfield, N.W. Australia, obtained the specimens from the nests, and also sent me a photograph of one close to his house, with the following information:—"These white ants are the common species about this district, and build their nests on the slopes of the slate ridges. They appear always to start them by swarming over a clump of spinifex (*Triodia*) grass, which is about two feet in height, and continue building their nests until they attain a height of from six to eight feet." Mr. Mansbridge's photograph shows an exceptionally tall nest, 14 feet in height, rounded at the base, and of a uniform diameter, but contracting at the summit into a rounded dome. He does not give me any information about its internal structure, but judging from a somewhat similar nest of *Eutermes* nearer the coast about Derby, King's Sound, it is probably thickly coated with earthy matter on the outer surface.

*EUTERMES TUMULI*, n.sp.

(Plate XXXV., fig. 9.)

General colour of upper surface castaneous, of under surface light brown; mouth-parts, legs, and antennæ pale ochreous, wings fuscous, nervures dark brown. The whole insect lightly covered with fine hairs. Length to the tip of the wings 6; to the tip of body 3 lines.

Head broad between the eyes, coming in sharply on the sides, from the antennal cleft to base of the jaws, convex on the summit, sloping down on the forehead. Eyes very large, circular, and projecting; ocelli large, reniform, in front of but contiguous to the front margin of the eyes. Antennæ 16-jointed, springing from a deep antennal cleft in front of the clypeus, 1st joint large, broad at apex, 2nd smaller, 3rd smallest, 4th to 9th uniform in size, broad and truncate at the extremities, 10th-15th more elongate and stalked, 16th elongate-oval. Clypeus large, deeply arcuate behind, sloping on the sides, and truncate in front; labrum broad, rounded in front, palpi long, hairy; jaws short and stout, with two stout angular teeth at the apex, a much shorter angular one below, and a lower hatchet-shaped edge. Prothorax large,



truncate in front; narrow on the sides and broadly rounded behind, but slightly depressed in centre. Legs long; thighs thick, rounded at the tip; tibiæ long, slender at the base; tarsi slender, long, claws large, spines small. Abdomen short and broad, cerci short, very broad at the base. Wings broad, rounded at the tips, more than thrice as long as broad; scapular shield small, with the base of the parallel nervures branching out close to the cross suture; costal and subcostal nervures very stout, running parallel to each other to the tip of the wing and thickened where they merge into each other; median nervure slender, running through the upper half of the wing, turning down and separating into four slender oblique nervures towards the tip of the wing; submedian nervure running very close to the median to the first fork, with ten oblique nervures, the first four stoutest, the third sometimes branched.

*Soldier*.—Head dull reddish-orange, snout brownish-black; legs and antennæ light brown; upper and lower surface of both thoracic and abdominal segments brown, with the segmental divisions barred with white. Length  $1\frac{1}{2}$  lines. Head slender, rounded behind, sloping on the sides to the long slender snout; antennæ long and slender, 12-jointed, 1st joint large, cylindrical, rounded at the tip; 2nd small, narrow at the base, rounded at the tip; 3rd-4th slender, elongate and coalescing at the junction; 5th-11th elongate-oval; 12th rounded at the tip. Thorax very narrow, rounded, with raised collar or ridge in front. Legs long, slender. Abdomen elongate-oval, more slender than usual; cerci small.

*Worker*.—Head reddish-brown except at the base where it is light coloured, with a pale parallel suture through the centre meeting a transverse one, thus dividing the brown colour into four sections; antennæ and legs dull yellow; dorsal surface of the thorax light brown; abdominal segments darker, ventral surface lighter-coloured. Length 2 lines.

Head large, broad behind, convex, sloping down on the forehead, and contracted at the sides beyond the antennal cleft. Antennæ 15-jointed; 1st joint large, 2nd smaller, broadest at the apex; 3rd to 5th fusiform; 6th to 14th turbinate; 15th rounded at the tip;



clypeus very large, convex, broadly oval, rounded on the sides; slightly truncate in front; labrum narrow, rounded in front; jaws stout, short, with two finely pointed teeth at the extremity, the lower one swelling out below with a small nipple, and an angulated tooth at the base. Thorax small, flattened on the dorsal surface, rounded behind. Legs rather short. Abdomen large, obese, and shorter than usual.

*Hab.*—Kalgoorlie, W.A. (from nest; Mr. G. W. Froggatt); Paisley Bluff, McDonnell Ranges, Central Australia (Professor Spencer).

Specimens of all forms of this species have been forwarded to me by my father, who says:—"It is the only mound-building species found in the Kalgoorlie district. The nests vary from a few inches in height and the same in diameter to 10 inches high and a foot in diameter at the base. I have seen none larger, and they are always situated under low scrubby bushes. When I first came to this district in the hot weather these nests were uninhabited, and the outer walls were so thin and dry that they crumbled under one's hand. Early in March we had some heavy thunderstorms that washed the outer shell off the nests, so that they look like a piece of coarse sponge full of irregular holes. After the storms the termites suddenly appeared, and on March 19th I found them mending up the walls of the nests, which, when restored, were of an irregular pyramidal form. I obtained workers, soldiers, and a few immature winged forms, but could not find a queen in a number of nests examined. After breaking up a nest I saw a great number of workers running about with small white particles which might have been eggs, but in all the nests there are great quantities of small grey globules which appear to consist of chewed up grass."

In the following October my father obtained a fine collection of winged forms, and also a lot of the "grey globules" before mentioned; the latter were submitted to Mr. H. G. Smith, of the Technological Museum, who analysed them, and informed me that they were simply masticated grass rolled up into little pellets.

Professor Spencer says:—"The nest of this species was found at the root of a spinifex bush, and was 1 foot 6 inches in height, and about 9 inches in diameter" (Horn Expedition, 1895).

EUTERMES PYRIFORMIS, n.sp.

(Plate xxxv., figs. 10, 10a, 10b.)

*Immature.*—Dull white, eyes reddish-brown. Length 5 lines.

Head longer than broad, rounded behind, narrow in front from the antennal cleft; eyes small; ocelli indistinct; antennæ 16-jointed, springing from a cleft in line with the eyes, 1st joint stout; 2nd half the length, rounded at the tip; 3rd smallest, rounded; 4th slightly larger; 5th to 15th turbinate; 16th oval. Clypeus narrow, lobed; labrum short, rounded in front; jaws broad, with two stout conical teeth at the tip, a broad axe-shaped space below, with a deep angular serration below, again swelling out at the base. Prothorax nearly truncate in front, narrow and sloping round on the sides and behind; legs stout, very hairy. Abdomen elongate-oval; cerci short and stout.

*Soldier.*—Head reddish-brown, smooth, shining and lightly covered with hairs; basal part of the snout black, tip reddish-brown; antennæ light brown, each segment distinctly barred with lighter colour at the tip; frontal ridge of prothorax brown; the rest light yellow. Length  $2\frac{1}{2}$  lines.

Head broadly rounded behind, snout tapering, a little shorter than the oval portion of head. Antennæ 14-jointed, very hairy; 1st joint stout, long, cylindrical; 2nd smallest; 3rd to 13th elongate-oval, broadest and rounded at the tips; 14th shorter, rounded; palpi long, slender; labial palpi much longer than the snout. Prothorax small, truncate in front, with a distinct collar behind the neck, rounded behind; legs long; thighs stout; tibiæ very long, cylindrical, hairy; tarsi short. Abdomen elongate-oval; segments large; cerci large, stout, conical and very hairy.

*Worker.*—Head pale ochreous, dorsal surface blotched with brown, divided across the centre by an irregular pale suture, the rest dull white. Length 3 lines. Head as broad as long, rounded behind and on the sides, contracted in front of the antennæ;

antennæ 15-jointed, more moniliform than in the soldier; clypeus small, broadest in the centre, and tapering at the extremities, with a very distinct transverse median suture, and a brown spot on either side; labrum small, rounded in front; jaws showing only a curious chisel-shaped cutting edge without any angular teeth. Prothorax small, truncate in front, rather angular on the sides, rounded behind. Abdomen large, broad, oval.

*Hab* —Palmerston, Port Darwin, N.T. (from the nest; Mr. N. Holtze).

The specimens described were obtained from some of the largest "column ant hills" about ten miles inland from Palmerston by Mr. N. Holtze, but whether these are the same as those found in North Queensland I am as yet unable to say. Measurements from photos of nests taken by Mr. Holtze give them a height of about 18 feet, columnar in form, about four feet in diameter at the base, swelling out a few feet above, and then running up with a uniform width to the irregular pointed summit, and the sides ribbed with projecting buttresses. The nests are generally (if not always) in the first instance built up a dead tree trunk, which is gradually enclosed and coated with earth, while the wood is devoured and replaced with hard granulated woody substance.

Both the soldiers and workers are somewhat like those of *Eutermes funipennis*, but the heads of both are much darker. I have been unable to obtain the winged insects, though Mr. Holtze has visited the nests several times on my behalf. I have some winged forms of a *Eutermes* taken round the lamps at night at Palmerston, which may be this species, but as they have not been identified I am holding them over.

*EUTERMES HASTILIS*, n.sp.

(Plate xxxv., fig. 7.)

Dorsal surface dark brown, ventral surface and legs lighter coloured, antennæ light brown, with the apex of each segment pale yellow; front of the head, sides of the body, and apex of the segments of the legs and tarsal joints dull white; wings pale fuscous, nervures brown, thickly covered with light brownish hairs. Length to tip of wings 6, to tip of body 4 lines.

Head broad, rounded behind, swelling out behind the eyes, sloping in towards the clypeus; flattened on the summit, and arcuate in the forehead, which is ornamented with a key-shaped mark in the centre; eyes large, circular, projecting; ocelli small, reniform, in front of the eyes and well in from the sides of the head. Antennæ 15-jointed; 1st very large, cylindrical; 2nd small, cylindrical; 3rd smallest, moniliform; 4th to 13th slightly increasing in size, turbinate; 14th somewhat larger; 15th elongate-oval. Clypeus large, convex, arcuate behind, rounded on the sides, truncate in front; labrum large; jaws short and broad, the terminal tooth rather blunt, with two angular and three more rounded ones, and an axe-shaped piece below. Prothorax slightly arcuate in front with the edge turned up, rounded on the sides to the base. Legs very hairy; thighs long, tibiæ very long and slender, with long apical spines; tarsi small. Wings long, broadly rounded at the tips, finely granulated; scapular shield short, only showing the base of costal, subcostal, and edge of first oblique nervures; costal and subcostal nervures stout, running close together to the tip; median nervure crossing the upper half of the wing, branching out into oblique nervures about a third from the base; these are variable both in number and bifurcations, but generally are six in number; submedian nervure very short, in most cases not reaching across more than half the wings, with eight irregular oblique nervures, but the 6th and 7th so deeply divided that there appear to be ten. Abdomen very hairy, large, narrow at base and broadly rounded at the tip; cerci small.

*Soldier*.—Head light reddish-brown, snout darker; antennæ and legs pale brownish; the rest dull white. Length  $1\frac{1}{2}$  lines. Head broad behind, long, slightly compressed on the sides; snout short; antennæ slender, 13-jointed; 1st joint long, cylindrical, rounded at the apex; 2nd about half the size; 3rd to 5th long, slender, 6th to 12th larger, not so much stalked towards the tip and broader; 13th broad, oval; palpi long and slender. Prothorax narrow, ridged in front; legs long and slender; tibiæ very much longer than usual, tarsi small. Abdomen elongate-oval, broadest in the centre, and tapering on either side; cerci small.

*Worker*.—Head pale yellow; the rest dull white. Length 2 lines. Head as broad as long, broadest behind the antennal cleft; summit convex, showing an angular whitish patch behind, and a dark reddish spot on either side of the clypeus. Antennæ 15-jointed, like those of the winged insect; clypeus large, convex, arcuate behind, with distinct median and cross sutures; labrum large, sloping on the sides to a rounded tip. Jaws long, with two sharp pointed teeth turning upward at the tips, the lower one running down with a curve and a knob, a sharp angular edge below followed by a broad tooth at the base. Prothorax small, saddle-shaped, with front marginal ridge, sloping down on the sides to base; legs long, slender. Abdomen large, ovate.

*Hab*.—Mackay, Queensland (Mr. Gilbert Turner).

Mr. Turner says: "These white ants were obtained from a nest about a foot in diameter, and six inches above the surface of the ground." But no particulars were given of the internal structure.

The soldiers differ from both *E. fumipennis* and *E. fumigatus* in the bright ferruginous colour of the head, and are intermediate in size between the two. The winged form is darker-coloured, and larger.

#### EUTERMES FUMIPENNIS, Walk.

(Plate XXXV., figs. 4, 4a.)

*Eutermes fumipennis*, Walker, British Museum Catalogue.

General colour light reddish-brown, head castaneous; eyes black, under surface light brown; wings pale fuscous, nervures brown. Length to tip of wings 8; to tip of body  $4\frac{1}{2}$  lines.

Head rounded behind, flattened on the summit, with a slight pale coloured median suture running from the back of the head to between the eyes; eyes very large, circular and projecting; ocelli elongate-oval; antennæ long, slender. 15-jointed, springing from antennal cleft well in front of the eyes; 1st joint stout, cylindrical; 2nd cylindrical, half the size, rounded at the tip; 3rd-14th of uniform length, turbinate, the terminal ones more truncate at the tips than basal ones, 15th elongate-oval; clypeus large, convex, arcuate behind, slender at the extremities, rounded

in front; labrum large, rounded in front; jaws large, stout, with two sharp curved teeth near the tip, the lower one prolonged into a chisel-shaped edge with a deep incision below; a stout angular tooth projecting beneath and sloping away to the base of the jaws. Prothorax small, slightly convex on summit, truncate in front, with the sides and base forming a half circle, slightly depressed at the back, mesothorax showing two large lobes between the base of the forewing. Legs stout, very hairy; thighs stout; tibiæ slender, tarsal spines on the hind legs large; tarsi short, claws large. Wings large, thrice and one-half as long as broad, rather narrow at the extremities; scapular shield moderately large; costal and subcostal nervures running parallel close together, and curving round the tip of the wing, joining in a slender point; median nervure running through the middle of the wing and curving downward about one-third from the tip, sending out two acute nervures besides the terminal one, which together with the last is bifurcated; submedian nervure only extending to the middle of the wing, sending out 9 stout, acute nervures, 7th and 9th bifurcated. Abdomen broad and stout, rounded at the tip; cerci small, conical.

*Queen*.—Head and thorax lighter-coloured. Abdomen 13 lines in length; 4 lines in diameter, cylindrical, segmental divisions only showing slightly upon the sides.

*Soldier*.—Head dark chestnut, snout black, antennæ brown, with the apex of each segment lighter-coloured. Length 2 lines. Head viewed from above pear-shaped, snout slender and pointed at the tip, with slight parallel suture. Antennæ 13-jointed; 1st very large, stout, cylindrical; 2nd about half as long, rounded at the tip; 3rd-13th elongate-oval, uniform in size. Prothorax small, saddle-shaped, with the front margin raised into a ridge. Legs long; thighs stout, tibiæ slender, broadest in the centre; tarsi small; claws large. Abdomen broad, oval; cerci small.

*Worker*.—General colour pale yellowish-brown; head broadly blotched with dark brown, forming a large rounded patch on either side, divided from each other by a light-coloured line, while another line runs into the back of each patch as well; a

reddish spot on either side of the clypeus. Length 3 lines. Head very broad and large, convex on the summit, flattened slightly on the forehead, sloping on the sides to the base of the jaws; clypeus very prominent, convex, broad and rounded behind, slightly lobed in the centre; labrum large, rounded; antennæ 13-jointed, springing from the antennal cleft behind the jaws; terminal segments more slender than those of the soldiers. Thorax very slender. Abdomen large, elongate-oval.

*Hab.*—Shoalhaven, Blue Mountains, Sydney, Newcastle (W. W. Froggatt); Southern Queensland, and Northern Rivers, N.S.W. (W. W. Froggatt); Mt. Lofty, S. Australia (Dr. Stirling); Gunbower, Victoria (Mr. George Perrin); Mackay, Queensland (Mr. Gilbert Turner); Kalgoorlie, W.A. (Mr. G. W. Froggatt).

This is the commonest species of the genus, with a very wide range over the greater part of Australia; wherever dead wood is found it is more or less in evidence, sharing with *Termes lacteus* the credit of doing more damage to woodwork than all the other species; but while the latter chiefly attack covered wood in houses, the former confine themselves more to fences and out-houses, and often eat out the roots and stems of cultivated plants that are dead or dying. They build the typical "negro head" arboreal nests on the trunks of trees, or small dome-shaped termitaria from six inches to two feet in height over stumps or logs. It is to this termite that the general description of the *Eutermes* nest and habits given in Part i. of this paper (pp. 433-5) has reference. In identifying this species as *Eutermes fumipennis*, Walker, I find in spite of his very brief description, which might apply to several, that it agrees in size and colouration; and though I have been unable to see the type in the British Museum, I think I can hardly be wrong in applying to my specimens Walker's specific name.

#### EUTERMES FUMIGATUS, Brauer.

(Plate xxxv., figs. 5, 5a.)

General colour dark brown, head darkest, smooth, shining; antennæ light-coloured at the apex of each joint; clypeus ochreous; thorax, legs, and under surface yellowish-brown; wings fuscous,



nervures dark brown. Length to tip of body 3; to tip of wings  $5\frac{1}{2}$  lines.

Head short, broadest behind, convex, sloping down sharply above the clypeus, truncate in front; eyes circular, moderately large, projecting very slightly; ocelli small, elongate, curved, a considerable distance in front of the eyes; antennæ short, stout, and hairy, springing from a deep antennal cleft in front of the eyes; 14-jointed; 1st joint large, cylindrical, rounded on the top; 2nd similar in form, but only about half the size; 3rd very small; 4th to 14th of uniform size, stout, and broad at the extremities, moniliform; clypeus prominent, slightly arcuate behind, rounded on the sides, and nearly truncate in front; labrum large, broad, and rounded in front; jaws rather long, with two pointed curved teeth near the tip; three angular teeth below, the first joining the base of the lower curved one. Prothorax broad, slightly convex, truncate in front, with the sides running round to the hind margin; legs robust; thighs short and stout; tibiæ rather short; tarsi long; claws large. Wings more than thrice as long as broad, rounded at the tips; scapular shield small; costal and subcostal nervures moderately stout, running parallel to the tip of the wing, but hardly curving round; median nervure running straight across the middle half of the wings and branching into an angular bifurcation near the tip; submedian nervure rather slender, with six stout oblique nervures, and five or six slender ones, several of them forked, but both the number of the nervures and their bifurcations variable. Abdomen broad and short, thickly covered with brownish-yellow hairs; cerci small.

*Queen*.—Length of abdomen 7; diameter  $2\frac{1}{2}$  lines. Thorax somewhat lighter-coloured than in the winged form.

*Soldier*.—Head ochreous, darker on the sides and snout; the rest pale brown, with the antennæ variegated by the segments being so much lighter at the tips. Length 2 lines. Head broad behind, tapering round to the snout, which is short and broad at the base; antennæ 13-jointed; 1st joint long, cylindrical; 2nd shorter; 3rd and 4th coalescing together, rounded; 4th shortest; 5th to 13th broad, turbinate; 13th oval. Prothorax small, with



front margin ridged, rounded on the sides, rather truncate behind. Legs long, slender; tibiæ of the forelegs short. Abdomen oval, tapering at the extremities, segmental divisions very distinct; cerci small.

*Worker*.—Head light brown, with a large blotch of darker reddish-brown covering the upper surface, slightly divided down the centre by a lighter band; legs, antennæ, and thorax pale brown; abdomen dull white. Length 2 lines. Head very broad behind, rounded on the sides, sloping in from the base of the antennæ; truncate in front; antennæ 14-jointed; clypeus large, truncate behind, rounded in front, but slightly arcuate in the centre; jaws short and stout, with two curved teeth at the tip, the upper one largest, at the base of the second a small indentation, arcuate, then curving out into a rounded ribbed edge at the base; thorax narrow, slender; legs long; abdomen, large, oval.

*Hab*.—Sydney, Shoalhaven, Newcastle, N.S.W. (W. W. Froggatt); Colo Vale, N.S.W. (Mr. Norman Etheridge).

This is a smaller species than *E. fumipennis*, with the head of the soldiers much lighter in colour. Though found in similar situations to the former it never builds nests, simply forming an irregular network of galleries under dead logs, sheets of bark, or stones, and sometimes attacking woodwork and old fences. The queen's cell is frequently broken when turning over a log and the queen and eggs exposed; winged ones were found in two nests under some large stones (at Thoruleigh) about 10 miles from Sydney on November 1st. Mr. Adamson sent me eight supplementary queens, together with a number of immature winged ones, taken from a nest at Uralla. I have never found more than a single queen in all the nests I have opened.

My specimens agree with Brauer's, except that his are slightly smaller. I am greatly indebted to the kindness of the Director of the Naturhistorisches Hofmuseum in Wien for co-types of Brauer's species, which he generously presented to me, so that I have been enabled to carefully compare them.

## EXPLANATION OF PLATES.

## PLATE XXXIV.

- Fig. 1. —Head of soldier of *Termes ferox*, n.sp.  
 Fig. 1a.—Wing of soldier    ,,        ,,  
 Fig. 1b.—Jaw of winged insect of *Termes ferox*, n.sp.  
 Fig. 2. —Head of soldier of *Termes lacteus*, n.sp.  
 Fig. 2a.—Wing of soldier    ,,        ,,  
 Fig. 3. —Head of soldier of *Termes meridionalis*, n.sp.  
 Fig. 4. —Head of soldier of *Termes errabundus*, n.sp.  
 Fig. 5. —Head of soldier of *Termes serratus*, n.sp.  
 Fig. 6. —Head of soldier of *Termes krisiformis*, n.sp.  
 Fig. 6a.—Labrum of soldier of   ,,        ,,  
 Fig. 7. —Head of soldier of *Termes acinaciformis*, n.sp.  
 Fig. 7a.—Wing of soldier    ,,        ,,  
 Fig. 8. —Head of soldier of *Termes turneri*, n.sp.  
 Fig. 8a.—Wing of soldier    ,,        ,,  
 Fig. 9. —Head of soldier of *Termes rubriceps*, n.sp.  
 Fig. 9a.—Jaw of worker of    ,,        ,,

## PLATE XXXV.

- Fig. 1. —Wing of *Termes australis*, Walker.  
 Fig. 2. —Head of soldier of *Termes paradoxus*, n.sp.  
 Fig. 3. —Head of soldier of *Termes perniger*, n.sp.  
 Fig. 4. —Head of soldier of *Eutermes fumipennis*, Walker.  
 Fig. 4a.—Wing of soldier    ,,        ,,  
 Fig. 5. —Head of soldier of *Eutermes fumigatus*, Brauer.  
 Fig. 5a.—Wing of soldier    ,,        ,,  
 Fig. 6. —Wing of *Eutermes magnus*, n.sp.  
 Fig. 7. —Wing of *Eutermes hastilis*, n.sp.  
 Fig. 8. —Wing of *Eutermes Triodia*, n.sp.  
 Fig. 9. —Wing of *Eutermes tumuli*, n.sp.  
 Fig. 10. —Wing of *Eutermes pyriformis*, n.sp.  
 Fig. 10a.—Jaw of winged insect of *Eutermes pyriformis*, n.sp.  
 Fig. 10b.—Jaw of worker of insect   ,,        ,,